

Appl. No. 09/887,997

Amdt. dated Oct 8, 2004

Reply to Office action of April 22, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-4. (Canceled)

Claim 5. (withdrawn) The method of claim 1 further comprising the use of a parallel structure to rapidly determine optimal conditions for crystallization.

Claim 6. (withdrawn) A system for crystallizing a target material comprising:

- an elastomeric block including a microfabricated chamber configured to contain a volume of a solution of the target material; and
- a microfabricated flow channel in fluid communication with the chamber, the flow channel introducing a volume of a crystallizing agent into the chamber.

Claim 7. (withdrawn) The crystallization system of claim 6 further comprising an isolation structure, the isolation structure configured to selectively isolate the chamber from the flow channel as the flow channel receives a volume

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of crystallizing agent, and then to place the chamber into contact with the flow channel to alter a solution condition within the chamber.

Claim 8. (withdrawn) The crystallization system of claim 6 wherein the volume of crystallizing agent is determined by a dimension of the flow channel.

Claim 9. (withdrawn) The crystallization system of claim 6 wherein the volume of crystallizing agent is determined by a length of the flow channel.

Claim 10. (withdrawn) The crystallization system of claim 6 wherein the volume of crystallizing agent is determined by a width of the flow channel.

Claim 11. (withdrawn) The crystallization system of claim 6 further comprising a control channel overlying the chamber and separated from the chamber by a membrane, the membrane deflectable into the chamber to exclude a calibrated volume of sample solution from the chamber, such that relaxation of the membrane draws the calibrated volume of the crystallizing agent into the chamber.

Claim 12. (withdrawn) The crystallization system of claim 6 further comprising:

- a plurality of first parallel flow channels in fluid communication with a target material; and
- a plurality of second parallel flow channels orthogonal to and intersecting the first flow channels to create a plurality of junctions, the second flow channels in fluid communication with a

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crystallizing agent such that an array of solution environments can be created at the junctions.

- Claim 13. (withdrawn) A system for crystallizing a target material comprising:
- an elastomeric block including a microfabricated chamber configured to contain a volume of a solution of the target material; and
 - a crystallizing agent reservoir in fluid communication with the microfabricated chamber through a dialysis membrane, the dialysis membrane configured to prevent flow of the target material into the crystallizing agent reservoir.
- Claim 14. (withdrawn) The crystallization system of claim 13 wherein the crystallization reservoir is formed in a second elastomeric block.
- Claim 15. (withdrawn) The crystallization system of claim 13 wherein the dialysis membrane is present within the elastomeric block.
- Claim 16. (withdrawn) The crystallization system of claim 13 wherein the dialysis membrane comprises a polymer that is introduced between the chamber and the reservoir and then subjected to cross-linking.
- Claim 17. (withdrawn) The crystallization system of claim 13 further comprising an intermediate solution imposed between the chamber and the reservoir to mediate diffusion of crystallizing agent into the chamber.

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Claim 18. (withdrawn) The crystallization system of claim 17 further comprising a second dialysis membrane imposed between the intermediate solution and the reservoir.

Claim 19. (currently amended) A method for crystallizing a target material comprising:

- providing a microfabricated elastomeric block having a chamber therein;
- ~~charging~~introducing into the chamber of a microfabricated elastomeric block ~~with a volume of a~~ solution of the target material; and
- ~~introducing a volume of a~~ crystallization agent into the solution in the chamber to change a solvent environment of the chamber.

Claim 20. (canceled) The method of claim 19 wherein the volume of crystallizing agent is introduced into the chamber by deforming an elastomer membrane overlying the chamber to exclude the volume of the sample from the chamber, followed by relaxing the membrane to cause the volume of a surrounding crystallizing agent to flow into the chamber.

Claim 21. (currently amended) The method of claim 19 wherein ~~the volume of~~ crystallizing agent is introduced into the chamber by entrapping a volume of crystallizing agent proximate to the chamber, and then opening an

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elastomer valve positioned between the chamber and the crystallization agent to allow diffusion of crystallization agent into the chamber.

Claim 22. (canceled) The method of claim 19 wherein the volume of crystallization agent is introduced into the chamber by diffusion across a dialysis membrane.

Claim 23. (original) The method of claim 19 wherein the chamber is defined by a junction between a first flow channel ~~orthogonal to~~that intersects a second flow channel, and wherein the sample is flowed through the first flow channel and the crystallization agent flowed through the second flow channel.

Claim 24. (original) The method of claim 23 wherein an array of chambers is defined by a junction between a first set of ~~parallel~~ flow channels ~~orthogonal to~~that intersect a second set of ~~parallel~~ flow channels, and wherein samples are flowed through the first flow channels and crystallization agents are flowed through the second flow channels to create an array of solution conditions.

Claim 25. (canceled) A method for crystallizing a target material comprising introducing a crystallizing agent to a target material solution in the presence of a surface having a morphology calculated to serve as a template for formation of a crystal of the target material.

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- Claim 26. (canceled) The method of claim 25 wherein the surface is a surface of mineral substrate exhibiting a regular morphology.
- Claim 27. (canceled) The method of claim 25 wherein the surface is a surface of semiconductor material exhibiting a morphology defined by features patterned by lithography.
- Claim 28. (canceled) A method for crystallizing a target material by vapor diffusion comprising:
- providing a target material solution within a microfabricated chamber;
 - providing a recrystallizing agent in fluid communication with the microfabricated chamber;
 - providing an air pocket between the chamber and the recrystallization agent, such that the crystallizing agent diffuses in the vapor phase across the air pocket into the target material solution.
- Claim 29. (canceled) The method of claim 28 wherein the air pocket is formed by trapping air during charging of the chamber with target material solution and introduction of the recrystallizing agent.
- Claim 30. (canceled) The method of claim 28 further comprising creating a hydrophobic material in contact with the air pocket, the hydrophobic

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material preventing target material solution and crystallizing agent from displacing the air pocket.

Claim 31. (canceled) The method of claim 30 wherein the hydrophobic material is created by microcontact printing an underlying substrate.

Claim 32. (canceled) The method of claim 30 wherein the hydrophobic material is created by flowing a hydrophobic fluid through a junction between the chamber and the crystallizing agent to leave the hydrophobic material as a residue.

Claim 33. (new) A method for crystallizing a target material comprising:

- providing a microfabricated elastomeric structure having a chamber therein;
- introducing into the chamber a solution of the target material;
- introducing a volume of a crystallization agent into the solution in the chamber, wherein the crystallizing agent is introduced into the chamber by entrapping a volume of crystallizing agent proximate to the chamber, and then opening an elastomer valve positioned between the chamber and the crystallization agent to allow diffusion of crystallization agent into the chamber; and,
- obtaining an image of the elastomeric structure.

Claim 34. (new) A method for crystallizing a target material comprising:

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- providing a microfabricated elastomeric structure having a chamber therein;
- introducing into the chamber a solution of the target material; and
- introducing a volume of a crystallization agent into the solution in the chamber, wherein the crystallizing agent is introduced into the chamber by entrapping a volume of crystallizing agent proximate to the chamber, and then opening an elastomer valve positioned between the chamber and the crystallization agent to allow diffusion of crystallization agent into the chamber; and,
- inspecting the chamber to reveal the presence of a crystal.

Claim 35. (new) The method of claim 34, further comprising removing the crystal from the chamber.

Claim 36. (new) The method of claim 34, wherein the inspecting is performed using a microscope.

Claim 37. (new) The method of claim 34, wherein the inspecting further comprises imaging the crystal.

Claim 38. (new) The method of claim 37, wherein the inspecting is performed using a microscope.